

Original Article

Acceptance of COVID-19 Vaccine among Adults in Two Urban Local Government Areas of Kwara State, North Central Nigeria

Idowu Ajibola^{1*}, Olowwokere Anu Samuel¹, Israel Kikelomo Oluseyi², Akinwumi Adebowale Femi³

¹Department of Community Medicine, Bowen University, Iwo Nigeria

²Department of Community Health, College of Health Sciences, Obafemi Awolowo University Ile-Ife, Nigeria

³Department of Community Health, Ekiti State University, Ado Ekiti, Nigeria

*Corresponding author: Idowu Ajibola. Department of Community Medicine, Bowen University, Iwo Nigeria. Email: idajibola@yahoo.com

Abstract

Background

Covid-19 has unquantifiable negative impacts on the world's socio-economic parameters. The rapid discovery of vaccines to fight this pandemic is a monumental scientific breakthrough.

Study objective

The study assessed willingness of adult Nigerians to accept Covid-19 vaccine and elucidated on factors influencing such decisions.

Methodology

Cross-sectional design was employed among 400 respondents recruited using multi-stage random sampling technique in Ilorin, Kwara-State, Nigeria. Pretested interviewer-administered, semi-structured questionnaire was used for data collection. Both descriptive and inferential statistics were carried out.

Results

Mean age \pm SD of respondents was 40.85 \pm 13.75 and 215 (53.7%) of them were males. Those who possessed good knowledge of Covid-19 were 321 (80.3%), but few respondents had misconceptions regarding its causation. Attitude to Covid-19 vaccination was positive in 360 (90%) of the respondents, 278 (69.5%) were willing to accept the vaccine. Respondents' Covid-19 knowledge and attitude to its vaccination were the main determinants of willingness to receive the vaccine.

Conclusion

The Nigerian government urgently needs to leverage on the positive attitude of the people to fully implement its covid-19 vaccination policies which can ensure effective coverage and equitable access to the revolutionary Covid-19 vaccines. Awareness campaign on practice of other preventive measures should be sustained to produce a synergistic control effort.

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Background

COVID-19 has emerged as one of the world's worst epidemics ever witnessed by humans. Within a space of two years, almost all the countries of the world reported cases of the disease. According to the Weekly Epidemiologic Report of the

World Health Organization (WHO) of 5th January, 2021, over 4 million new cases were reported globally.[1] In the same year, the case fatality rate increased by 3%, bringing the number of deaths to about 76, 000 people per week.

As of 5th January, 2021, over 83 million cases were reported and more than 1.8 million deaths recorded globally since the commencement of the pandemic in 2020. [1] As of 21st April, 2022, 504,079,039 confirmed cases of COVID-19 have been made and 6,204,155 deaths recorded worldwide. [2]

Reports from the Nigeria Centre for Disease Control (NCDC) puts the total confirmed cases as of January 2021 at 110,387, total deaths at 1,435 with 19,635 active cases. [2] In Kwara State Nigeria, total confirmed cases were 1,566, total deaths were 32 while there were 199 active cases. [3] By 21st April, 2022, not less than 255,670 COVID-19 cases were confirmed and 3,143 deaths recorded in the 36 states of Nigeria and the Federal Capital Territory. [4] Since the onset of the pandemic, new strains of coronavirus have emerged. They include the alpha, beta and gamma strains, as well as the Currently Circulating Variants of Concern (VOCs), Delta and Omicron strains. [5]

Covid-19 came with immense health and socio-economic implications. There have been disruptions of national and international trade due to lockdowns imposed by governments of nations and closing of international borders as control measures. Health systems became overstretched in many of the worst affected nations. In addition, varied psychological consequences of covid-19 have been documented in patients with the disease as well as their relatives. [6-8]

Since the primitive variolation era popularized by Edward Jenner (regarded as founder of modern vaccinology), [9] and the discoveries of vaccines for cholera and anthrax by Louis Pasteur, [10] vaccination has gone through considerable scientific research and development to become one of the cornerstones of infectious disease prevention and control globally. In fact, vaccination is now regarded as one of the most cost-effective public health interventions ever known. According to Global Alliance for Vaccine and Immunization (GAVI),

vaccination is one of the most cost-effective ways to save lives, improve health and ensure long-term prosperity. [11] Globally, 2-3 million deaths are being averted through effective vaccination. [11]

There have been several global efforts to ensure effective coverage of various vaccines which have been produced against different diseases. For instance, the Expanded Programme on Immunization was established in 1974 by the WHO with the goal of providing universal immunization coverage to all children by 1990. [12] About 10 years later, the National Programme on Immunization (NPI) was formed by the Nigerian Government to consolidate the gains of EPI with targets and strategies to facilitate universal coverage of the available vaccines in the country. More recently, the Nigerian government partnered her relevant agencies to develop the (2018-2028) Nigeria Strategy for Immunization and Primary Healthcare System Strengthening (NSIPSS) aimed at ensuring sustainable immunization outcome in the country. [13]

Currently, newer vaccines have been developed. In November, 2019, WHO licensed the Ebola vaccine (Ervebo) by certifying that it met the organization's standards for quality, safety and efficacy. [14] Since then, The Democratic Republic of Congo (DRC), Burundi, Ghana and Zambia have licensed this vaccine. The approval by these countries has been aptly described as 'another milestone in the fight against the unforgiving disease' by the current WHO-DG. [14]

However, developing vaccine against COVID-19 has become the most pressing public health challenge of our time. Thus, global scientific efforts were harnessed to overcome this challenge. As a result, not less than 21 covid-19 vaccines have been given Emergency Use Authorization (EUA) and are currently in use while additional 137 new candidates are undergoing clinical trials [15]. COVAX which is the vaccines pillar of the Access to COVID-19 Tools (ACT)

Accelerator was formed with a mandate to accelerate the development of Covid-19 vaccine, also to ensure fair and equitable distribution to all countries of the world.[16]

Some of the prominent EUA vaccines currently in use include the Pfizer/BioNTech candidate, Oxford/AstraZeneca candidate and the Moderna candidate.[17] Pfizer's vaccine was authorized on Dec. 12, 2020, and Moderna's version on Dec. 18, 2020 by Food and Drug Administration of the United State of America. Two doses (0.3ml, intramuscular) given within 21 days interval of the Pfizer BioNTech vaccine is required for immunity (to be administered to people who are at least 16 years old). [17] Similarly, 2 doses (0.5ml, intramuscular) of Moderna Covid-19 vaccine given within 28 days interval is required for immunity among people who are 18 years or older. [17] Also, 2 doses of AstraZeneca vaccine given at 4-12 weeks intervals has also been approved among people aged 18 years or older by the UK Government.[18] Other vaccine candidates are coming on board from countries such as India and Russia. However, some side effects of these vaccines have been reported. These include swelling or pain at the point of injection, tiredness, fever, headache, and muscular/joint pains. Early safety monitoring of some of the vaccines had also revealed anaphylactic reactions.[19] Furthermore, reported deaths following Covid-19 vaccination are being investigated.[20]

Since the arrival of the first batch of covid-19 vaccines in Nigeria in 2021, a total of 33,932,163 vaccine doses have been administered according to WHO [21]. The country has also demonstrated proactiveness at ensuring effective covid-19 vaccine coverage. For instance, the Nigerian National Task Force on Covid-19 announced the mandatory covid-19 vaccination programme for all workers in federal institutions in December 2021. Thus, with effect from 1st December, 2021, all federal government employees are expected to show proof of vaccination

or present a negative COVID-19 PCR test result done within 72 hours, before they can be allowed into their workplaces. Similar pronouncement was made by some state governments.[22] However, it is not currently clear how these measures have impacted on the willingness of Nigerians to accept covid-19 vaccines at the community level.

With the scientific breakthrough in Covid-19 vaccine production comes the possible challenge of vaccine hesitancy which may likely be encountered in many African countries. This is because of the widely circulated myths and conspiracy theories regarding Covid-19 causes, treatment and vaccination in the continent and in Nigeria specifically. One of the most popular conspiracy theories regarding Covid-19 cause is the believe that the disease is not caused by a viral agent but by emissions from 5G masts which have been erected in different locations. Another one is the belief that Covid-19 virus cannot survive hot weather in most African countries. As these theories are not evidence-based, the WHO had dispelled their veracity.[23] Perhaps due to low case fatality rate in Nigeria, some Nigerians do not believe in the existence of the disease while many of them are doubting the authenticity of the number of new cases being published by the Nigerian Centre for Disease Control and Prevention (NCDC). The situation become worrisome as prominent religious leaders with teeming population of followers are the ones spreading the theories. [24]

Also, some Nigerian governors have continuously denied the presence of covid-19 in their states.[25] With this level of misconception and misinformation (infodemics) regarding Covid-19 in Nigeria, vaccine acceptance may be severely hindered. Meanwhile, studies conducted in other parts of the world show willingness of the people to receive covid-19 vaccine.[26-28] A study conducted in six sub-Saharan countries (including Nigeria) revealed that at least four in five study participants were willing to be vaccinated in all but one of the countries where the survey took place.[29]

It is thus imperative to assess the willingness of Nigerians to accept the vaccines. The study was guided by the Confidence, Complacency, Convenience (the 3Cs) Model of Vaccine Hesitancy which illustrates the main determinants of vaccine hesitancy. [30] Confidence relates to the trust people have in the potency and safety of a vaccine, complacency is lack of vaccine acceptance due to low-risk perception while convenience relates to physical and financial access to the vaccine.

This study assessed the willingness of adult Nigerians to accept Covid-19 vaccine and elucidated on factors influencing such decisions.

Material and Methods

Study site

This study was conducted in Ilorin East and West Local Government Areas (LGAs) of Kwara State, Nigeria, between December 2020 and January 2021. Based on the 2006 census figures for Nigeria, the projected populations were estimated in 2020 to be 280,000 for Ilorin East and 493,000 for Ilorin West, respectively.[31] The inhabitants of the two LGAs are predominantly of Yoruba ethnic group but other tribes including Nupe, Baatonum, Hausa and Igbo are also resident in the LGAs. Most people in the LGAs are small scale farmers and civil servants.

Study design, sample size determination and sampling method

The study design was descriptive cross-sectional survey. The Cochran formula for estimating sample size in a population with more than 10,000 inhabitants was used.

$$n = Z^2 pq / d^2$$

where:

n=minimum sample size

Z=Standard normal deviate at 95% confidence limit (1.96)

p= proportion of study participants who we expect to be willing to receive covid-19 vaccine.

Based on the results of a global survey on Covid-19 vaccine acceptance by Lazarus et al. (2020),[32] authors assumed that 72% of our intended study participants will be willing to accept the vaccine.

Thus “p” = 0.72

q=1-p = 1-0.72 = 0.28

d= tolerable error margin taken as 5%

Thus,

$$n = 1.96^2 \times 0.72 \times 0.28 / 0.05^2 = 310$$

A 10% non-response rate was envisaged and corrected for using this formula

$N = n / 1 - \text{non-response rate}$

Where N= Final sample size, Thus, $N = 310 / 0.9 = 344$

All consenting adults who were 18 years or older were interviewed but those adjudged to be too incapacitated by health conditions to give valid responses to our questions were exempted from the research. Multi-stage random sampling method was engaged in recruiting eligible respondents. In the first stage, both Ilorin East and West were purposively selected from the list of 18 LGAs in Kwara State. Secondly, the list of electoral wards in the chosen LGAs were obtained from their respective headquarters and one electoral ward was selected from each of the LGA through balloting. The chosen electoral wards were Zango and Adewole in Ilorin East and West, respectively. In the third stage, all households with eligible respondents were visited for interviews. In households with more than one eligible respondent, one was selected using simple random method (balloting) till the required sample size was reached.

Data collection method and instruments

Data were collected using semi-structured interviewer-guided questionnaire based on findings from previous studies.[28-32] The questionnaire was written in simple English language but translated into Yoruba, (which is the major language spoken by the study population) by linguistic experts, and back translated into English language to preserve the original meaning of the questions asked. The instrument was used to collect information on respondents' socio-demographic characteristics,

knowledge on covid-19, attitude to Covid-19 vaccination and their willingness to accept the vaccine. Four graduates were recruited and trained to assist in data collection. The training which was conducted by the principal investigator lasted 2 days and involved practical demonstrations. The instrument was pretested among 40 respondents in Ilorin South LGA which is different from the two LGAs used for the main study. The exercise helped to strengthen the internal validity of the instrument. Observed ambiguous or irrelevant questions were re-phrased or removed in line with study objectives.

Data analysis

The data were field edited daily and Statistical Package for Social Sciences (SPSS) version 21 (SPSS Inc, Chicago, IL, IBM Version) was used for analysis. Data were analysed using descriptive and inferential statistics. Chi-square test was used as inferential statistics at the bivariate level while stepwise binary logistic regression model was built at the multivariable level. Variables were imputed into the model based on whether they were statistically significant at the bivariate level. Adjusted odds ratio (AOR) and 95% CI were presented and used as measures of the strength of association. A p-value <0.05 was accepted as statistically significant.

Operational definitions of key variables

Respondents' knowledge of Covid-19:

Ten questions were asked on causes, mode of transmission, common misconceptions around the disease and its prevention. Correct answers attracted one point while incorrect answers or 'don't know' attracted 0-point. Answers from each respondent were scored and rated over 100. Those who scored less than 50% were categorized as having poor knowledge.

Respondents' attitude to Covid-19

vaccination: Twelve questions were positively phrased on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Answers were summed up and converted to percentage. A score of 50% or less was classified as negative attitude to Covid-19 vaccination.

Respondents' socio-economic status:

Using Oyedeji's classification of Social Class,[33] respondents' socio-economic status was classified into three: low, middle and high. This classification used a composite score of respondents' educational levels and occupational types. The scores ranged from 1 to 5 for both variables. Respondents' scores from each of the occupational and educational categories were added together and rated out of 10. Those who scored less than 5 points were grouped into lower social class; scores from 5 to 7 points were grouped into middle social class while those who scored between 8–10 points were grouped into high social class.

Ethical consideration

Approval to conduct the study was obtained from the Bowen University Ethical Review Committee (NHREC/12/04/2012) and permission received from the Department of Primary Health Care, Ilorin East and West LGAs respectively. Written consents were obtained from study participants before they could participate in the study. Participation was entirely voluntary. Confidentiality was ensured by making the questionnaire anonymous and by entry of data in a passworded computer which was eventually, only accessible to the principal investigator.

Results

Of the 430-questionnaires administered, 400 were returned satisfactorily completed (Response Rate=93.0%). Mean age \pm SD of respondents was 40.85 \pm 13.75 with 51.5% of them in the 21–40-year age category. Of the respondents, 215 (53.7%) were males and 217 (54.3%) practiced Islamic religion. One hundred and seventeen (42.8%) of the respondents were in the lower socio-economic class with 173 (43.2%) of them earning less than 30,000.00 naira (78.7 USD) monthly and 275 (68.7%) of them having at least four children (Table 1).

Table 1. Socio-demographic variables of respondents

Variable	n=400	(%)
Age		
≤ 20	18	4.5
21 – 40	206	51.5
41 – 60	136	34.0
≥ 61	40	10.0
Mean age ± SD	40.85 ± 13.75	
Sex		
Male	215	53.7
Female	185	46.3
Religion		
Christianity	176	44.0
Islam	217	54.2
Traditional	7	1.8
Social class		
High	103	25.8
Middle	126	31.4
Low	171	42.8
Marital status		
Never married	95	23.8
Married	290	72.5
Divorced	9	2.2
Separated	2	0.5
Widowed	4	1.0
Average monthly income ('000)		
< 30	173	43.2
30 – 60	189	47.2
61 – 90	13	3.3
≥91	25	6.3
Mean ± SD	37179.00 ± 29314.03	
Family size		
< 4	125	31.3
≥4	275	68.7
Mean ± SD	4.36 ± 1.95	

All respondents were aware of Covid-19 and mass media was the main source of information as reported by 190 (47.5%) of the respondents. While 321 (80.3%) of the respondents knew Covid-19 is caused by viral agent, 16 (4.0%) of them believed it was caused by radiations from 5G masts. Forty-six (11.5%) of the respondents stated that occurrence of the disease was a punishment from God.

Three hundred and nine (77.3%) of the respondents believed the cases being reported in Nigeria were fabricated while 218 (54.5%) of them believed some people are making merchandise of Covid-19. However, 248 (62.0%) of the respondents believed that every individual is at risk of the disease. Meanwhile, 185 (43.6%) of the respondents rated Nigerian governments' covid-19 control strategies as average (Table 2). In Figure 1, 333 (83.3%) of respondents stated they used face masks regularly especially in public places, 206 (51.1%) practiced regular handwashing with soap and water, 216 (54.0%) used hand sanitizers while only 79 (19.8%) practiced social distancing.

Table 2. Respondents’ knowledge on COVID-19 and willingness to receive Covid-19 vaccine

Variable	n	%
Source of information on COVID-19		
Social media	137	34.3
Mass media	190	47.5
Health workers	40	10.0
Friend/family	22	2.8
Others	11	5.4
Knowledge on causes of COVID-19		
A viral infection	321	80.3
A disease invented by scientist	0	0.0
Caused by radiations from 5G masts	16	4.0
A punishment from God	46	11.5
Do not know	17	4.2
*View on COVID-19		
It is a disease of the elites only	70	17.5
It is a disease for the white people only	23	5.8
It does not exist in Nigeria because the temperature is too high for its survival	42	10.5
The cases being reported in Nigeria are false	309	77.3
Some people are just using the disease to make money	218	54.5
Opinion on who is mostly at risk		
International Travelers only	32	8.0
Children only	32	8.0
Elderly only	36	9.0
Those with underlying diseases such as diabetes only	52	13.0
Everybody in the community	248	62.0
Assessment of Nigerian government COVID-19 control efforts		
Excellent	30	7.5
Very good	77	19.3
Good	55	13.6
Average	185	46.3
Poor	53	13.3
Opinion on COVID-19 control measures		
Use of face mask in public places should continue	313	78.3
Ensure continuous enforcement of COVID-19 prevention guidelines	238	59.5
Willingness to receive COVID-19 vaccine		
Yes, even if I need to pay for it	192	48.0
Yes, if it is given free	86	21.5
I can never take the vaccine	52	13.0
Undecided now	70	17.5

*Multiple response

Table 2. Respondents’ knowledge on COVID-19 and willingness to receive Covid-19 vaccine

Variable	n	%
Reason for vaccine acceptance	n=278	
Confident of vaccine potency	139	50.0
For the benefits of others	134	48.2
To avoid likely punishment from government	5	1.8
*Reasons for lack of vaccine acceptance	n=115	
Low risk perception	69	58.7
Fear of side effects	20	17.4
Has heard many bad things about the vaccine	19	16.5
Do not believe the vaccine can work	3	2.6
No money for vaccine	5	4.3
No believe system in the vaccine	7	6.1
Has been warned never to receive the vaccine by religious leaders	3	2.7

*Multiple response

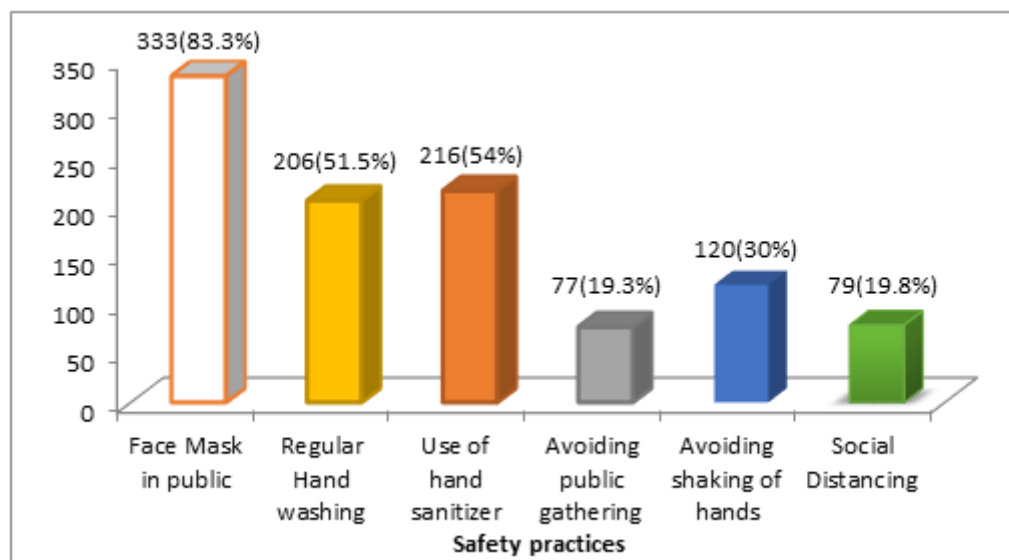


Figure 1. Respondents’ current COVID-19 safety practices (Multiple responses allowed)

Figure 2 reveals that 360 (90%) of respondents had positive attitude to COVID-19 vaccination and 192 (48.0%) of them were willing to receive the vaccine even if they will have to pay for it. Also, 86(21.5%) of the respondents indicated interest to receive the vaccine if it is made free but 52 (13.0%) were not prepared to receive the vaccine as at the time of the survey. The main reason for COVID-19 vaccine acceptance was confidence in the efficacy of the vaccine, stated by 139 (50.0%) of the respondents. For non-vaccine acceptors, low- risk perception was the main reason, reported by 69 (58.7%) of them (Table 2).

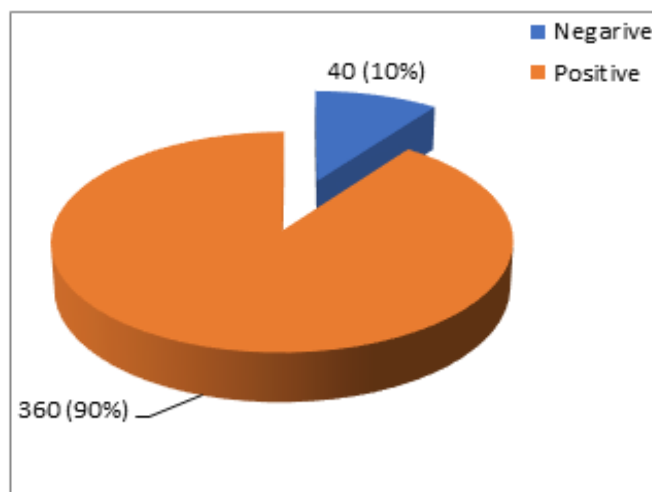


Figure 2. Respondents’ Attitude to COVID-19 vaccination

Table 3 reveals that family size, respondents' knowledge on COVID-19 and their attitude to COVID-19 vaccination were the factors which were significantly associated with willingness to receive the vaccine. At the multivariable level however (Table 4), only knowledge and attitude were the significant predictors of willingness to receive COVID-19 vaccine.

Respondents with good knowledge were 3 times more likely to accept vaccination compared to those with poor knowledge (AOR=2.63; 95% CI=1.488-4.640). Similarly, respondents with positive attitude were 10 times more likely to accept the vaccine compared to those with negative attitude (AOR=9.47; 95%CI=4.33-10.70).

Table 3. Factors influencing willingness to accept COVID-19 vaccine among the respondents

Variables	Willing to accept COVID-19 vaccine		Total	X ²	P-value
	Yes	No			
Age				2.072	0.558
≤ 20	10 (55.6)	8 (44.4)	18		
21 – 40	147 (71.4)	59 (28.6)	206		
41 – 60	93 (68.4)	43 (31.6)	136		
≥ 61	28 (70.0)	12 (30.0)	40		
Sex				2.616	0.106
Male	142 (66.0)	73 (34.0)	215		
Female	136 (73.5)	49 (26.5)	185		
Religion				0.916	0.633
Christianity	121 (68.8)	55 (31.2)	175		
Islam	151 (69.6)	66 (30.4)	217		
Traditional	6 (85.7)	1 (14.3)	7		
Social class				2.003	0.367
High	77 (74.8)	26 (25.2)	103		
Middle	87 (69.0)	39 (31.0)	126		
Low	114 (66.7)	57 (33.3)	171		
Marital status				1.993	0.737
Never married	68 (71.6)	27 (28.4)	95		
Married	200 (69.0)	90 (31.0)	290		
Divorced	5 (55.60)	4 (44.4)	9		
Separated	2 (100.0)	0 (0.0)	2		
Widowed	3 (75.0)	1 (25.0)	4		
Average monthly income(Naira)				3.162	0.367
< 30, 000	118 (68.2)	55 (31.8)	173		
30,000 – 60,000	136 (72.00)	53 (28.0)	189		
61,000 – 90,000	10 (76.9)	3 (23.1)	13		
≥91,000	14 (56.0)	11 (44.0)	25		
Family size				4.324	0.038
< 4	78 (62.4)	47 (37.6)	125		
≥4	200 (72.7)	75 (27.3)	275		
Knowledge on cause of COVID-19				8.849	0.003
Good	234 (72.9)	87 (27.1)	321		
Poor	44 (55.7)	35 (44.3)	79		
Attitude to COVID-19 vaccination				36.985	< 0.001
Positive	267 (74.2)	93 (25.8)	360		
Negative	11 (27.5)	29 (72.5)	40		

Table 4. Determinants of willingness to accept COVID-19 vaccine among the respondents

Variables	Willing to accept COVID-19 vaccine		B coefficient	p-value	AOR	95%CI
	Yes	No				
Family size						
< 4	78(62.4)	47(37.6)	-0.347	0.204	0.707	0.414 – 1.208
≥4RC	200(72.7)	75(27.3)				
Knowledge on cause of COVID-19						
Good	234(72.9)	87(27.1)	0.966	0.001	2.628	1.488 – 4.640
Poor RC	44 (55.7)	35(44.3)				
Attitude to COVID-19 vaccination						
Positive	267(74.2)	93(25.8)	2.248	0.001	9.468	4.333 – 20.690
Negative RC	11(27.5)	29(72.5)				

*AOR=Adjusted Odds Ratio, CI=Confidence Interval RC=reference category

Discussion

The current study revealed that all respondents were aware of COVID-19, with more than three-quarters of them possessing good knowledge of the disease and mass media being the main source of information. This finding agrees with reports from similar studies. For instance, it has been shown that the general awareness level about COVID-19 was good in the Arabian countries.[34] An online cross-sectional survey conducted in China also reported that 91.2% of the respondents had good knowledge of COVID-19.[35] Similarly, a cross-sectional study conducted in North Central Nigeria revealed that 99.5% of the interviewees had good knowledge of the disease [36]. Finding that most respondents in the current study possessed good knowledge of COVID-19 is not an unexpected outcome. The pandemic nature of the disease, the associated lockdowns and massive interruptions of normal way of life could have forced even non-medical persons to be more interested in knowing somethings about the disease. Likewise, it shows that public awareness programmes delivered through various channels had positive impact on the people.

However, some of the respondents still believed that COVID-19 was caused by radiation from 5G masts or punishment from God. Others felt the disease only affected the rich people and the Caucasians and that the hot Nigerian weather could not support the spread of the disease. Many of the study participants did not even believe that the number of cases that were being reported per day by NCDC were true, stating that COVID-19 is a planned work of politicians to loot the Nigerian treasury. A study conducted in Northwest region of Ethiopia demonstrated that 56.9% of respondents had misconception about COVID-19.[37] A similar study conducted in Ibadan, South West Nigeria also pointed out remarkable misconceptions about the disease.[38] Yet, studies have documented how misinformation has led to vaccine hesitancy in the past.[39-42] The impact of this “infodemics” can be grave on acceptance and uptake of COVID-19 vaccine if not countered. A clear example of this was the skepticism that Oral polio vaccine could cause sterility and cancer in children. The political and religious leaders in some Northwest Nigerian states brought polio immunization campaign to a halt by holding on to this non-evidence-based information,

leading to a total vaccine refusal and immensely retarded the polio elimination efforts in the country.[42] Yet, intervention aimed at increasing awareness and knowledge regarding vaccination has been identified as being quite successful in enhancing vaccine uptake.[43] There is thus an urgent need to intensify awareness campaigns to stem the effects of this misconceptions on vaccination.

Many of the respondents rated Nigerian governments' COVID-19 control strategies as average in the current study. This could reflect a prolonged lack of trust between the government and the governed. The inability of the governments at various levels to provide trustworthy social safety nets especially during the lockdown could have accounted for this average rating among the respondents. The occurrence of End-SARS protest which led to massive looting of stores where the supposed COVID-19 palliatives were kept could be a pointer to the level of dissatisfaction of Nigerians regarding COVID-19 control efforts. The Nigerian governments needs to be more proactive in building trust regarding the procurements and administration of the COVID-19 vaccine. Information on the need to continue preventive measures even in the phase of vaccination should be sustained as only 19.8% and 51.1% of our respondents in the current study practiced social distancing and regular handwashing.

The current study revealed that 90% of respondents had positive attitude to COVID-19 vaccination with about half of them even willing to pay for the vaccine if available. Positive attitude together with good knowledge score were also identified as a significant predictor of vaccine acceptance among our respondents. Moreover, many of the respondents who were willing to accept believed in the potency and efficacy of the vaccine (had confidence in the vaccine). This is despite the ongoing misinformation and misconception regarding the disease and/or the vaccine. The Nigerian government needs to leverage on this positive attitude to ensure that the vaccine is equitably distributed,

not neglecting the poor and the rural dwellers who often tend to be disadvantaged with regard to healthcare access in Nigeria. Even though the vaccine is made available for free by the Nigerian governments, the indirect cost of transportation to vaccination sites and the hidden cost which may be associated with prolonged waiting time at the health center, may hinder vaccine uptake. Hence, these issues relating to "Convenience" should be systematically addressed in the national COVID-19 vaccination programming. The contextual factors can be addressed by ensuring that vaccines are readily available at the LGA levels with friendly opening times of health centers where vaccine can be obtained. Although the waves of Covid-19 pandemic appear to be subsiding globally, there is need for continued supportive messaging from governments on COVID-19 vaccine and encouragement of social endorsement of the vaccination programme by prominent Nigerians. Governments should ensure transparency in communication regarding COVID-19 vaccine safety and administration.

In addition, the Nigerian government needs to provide easy access to evidence-based information on COVID-19 vaccination. This will involve partnering with media houses and actively engaging the social medial platforms, bloggers, and theater art practitioners to ensure that the circulating information on the vaccine is accurate, trustworthy, and reliable. Community gatekeepers and Community Based Organizations (CBOs) should also be actively engaged in mobilizing people for the vaccination programme. Furthermore, various channel of communication should be utilized in disseminating information regarding the safety of the vaccine. Furthermore, simple, and clear (local) language messages should be used in dispelling the myths regarding COVID-19 and its vaccination so that effective coverage can be attained, and herds immunity strengthened against the disease. Detailed advocacy plans should be drafted and implemented to make

the political gladiators and religious leaders to buy-in in the vaccination campaign as some Nigerian governors still deny occurrence of COVID-19 in their states. Such governors may not be supportive of COVID-19 vaccination in their states. As Nigeria, like other countries, battles the fourth wave of the disease and societal activities gradually returning, there is need to fully implement the national covid-19 vaccination policy which will ensure constant availability and access to the COVID-19 vaccines. The cold chain equipment in each state and LGA should be upgraded to avoid vaccine wastages and administration of denatured vaccines.

Study limitation

This study may have been affected by social desirability bias, a tendency to respond based on what the respondent feels will be socially acceptable but may not be the actual truth. The fact that the questionnaire was made anonymous and the fact that confidentiality of information provided was assured may have reduced the effects of this bias.

Conclusion

Respondents in the current study have predominantly positive attitude to COVID-19 vaccination and are largely willing to accept the vaccine. The Nigerian governments urgently need to fully implement the already formulated policies/strategies to ensure effective covid-19 vaccination coverage for optimal herds immunity and prevention of re-emergence of the disease in the country. Awareness campaign on practice of other preventive measures should be sustained. The two control strategies should be harmonized to work in synergistic manner to reduce disease burden and pave the way for rapid socio-economic recovery in Nigeria.

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Conflict of interest

Authors had no conflict of interests regarding the conduct of this research.

Authors Contributions

AI conceived the research idea and coordinated the research process. AAF managed the data collection and analysis aspect. SAO and OKI reviewed the original draft for important intellectual contents. All authors approved the manuscript for publication.

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